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J.D. Pagan



INFLUENCE OF HOUSING ON BONE GROWTH AND CARTILAGE METABOLISM IN WEANLING HORSES

R. A. BELL, B. D. NIELSEN, M. ORTH, J. SHELLE, J. CARON, AND C. HELESKI
Michigan State University, East Lansing, MI

Young horses are often housed in stalls as opposed to being out on pasture allowing free access to exercise. The objective of this study is to determine whether housing weanling horses in stalls is detrimental to bone growth and development compared to bone growth in weanling horses maintained on pasture. Additionally, the effect of stalling versus pasture-rearing horses on cartilage metabolism will be determined. Stalling may be detrimental to bone growth due to a lack of exercise. Exercise allows the bone to respond to changes ensuring bone mass capable of withstanding pressures (loading). Without the necessary exercise, bone will begin degrading until the bone is adapted to minimal loading. The degradation of cartilage in response to stalling may be due to cartilage needing a mechanical signal (exercise) to stimulate new proteoglycan synthesis to provide a greater compressive resistance and without this exercise/mechanical signal, cartilage will begin degrading. Numerous studies have demonstrated that depriving animals of free exercise is detrimental to bone and muscle strength. Laying hens housed in battery cages have weaker bones than those housed in perches, demonstrating that bone strength is related to the amount of movement allowed. Stalled horses have also shown a decrease in the rate of bone formation, an increase in bone resorption, and a decrease in bone mineral content. Horses allowed free access to exercise showed a decrease in incidence of osteochondrosis and an increase of newly synthesized proteoglycans. Our hypothesis is that stalling retards bone growth and development and is detrimental to cartilage growth. To test this hypothesis, eighteen Arabian weanlings (from four to five months of age), from Michigan State University Horse Teaching and Research Center, will be age matched and randomly assigned to two treatment groups, pastured horses (P, n=9) and stalled horses (S, n=9). The same design will be used with 18 Quarter horse weanlings from the Michigan State University Merillat Equine Center. Group S will be confined to stall housing with no access to free exercise while Group P will be maintained on pasture. Horses will be maintained on the study for three months and will be individually fed concentrate twice daily and allowed free choice roughage meeting NRC recommendations for feeding weanlings. Blood samples will be taken every two weeks via jugular venipuncture and serum will be collected. The serum will be analyzed for deoxypyridinoline (marker for bone resorption), osteocalcin (marker for bone development), and keratan sulfate (marker for cartilage degradation). Dorsal-palmar radiographs of the left front leg will be taken every 28 days to determine the radiographic bone aluminum equivalence (RBAE) in order to estimate the mineral content, and hence bone strength of the third metacarpal.

